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ABSTRACT

Five categories of data collection are recommended for monitoring the quality of education: (1) outcomes, based on an input-output model, including data from student testing and credentials and degrees; (2) participation--who is served by education; (3) resources available to education; (4) long-term impact of education on work, income, self-esteem, and the society; and (5) purposes--needs of and expectations for the education enterprise. It is suggested that the following data sets be collected by the National Center for Education Statistics (NCES): student achievement, such as the National Assessment of Educational Progress and state comparisons; course enrollment; teacher quality and teacher supply and demand; and curriculum content. Additional comments are made suggesting the usefulness of further research on international comparisons; informal, out-of-school education; technology; data compatibility; and data interpretation. Although this paper sets forth criteria for monitoring the educational system, it is also recommended that the more difficult task of establishing standards be performed, to measure the degree to which criteria are met. (GDC)

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MONITORING THE CONDITION OF EDUCATION

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Executive Summary

This paper responds to the NCES invitation to participate in the process of redesigning the elementary and secondary education data program. The purpose of NCES is seen in terms of monitoring the adequacy of the Nation's education enterprise in meeting individual and societal needs and expectations. To do this, a sense of mission for the enterprise is essential. This mission is proposed in terms of producing leaders, technical specialists, and informed citizens, and for addressing equity concerns and optimal use of talent.

A framework for monitoring the education enterprise is described consisting of five categories of variables. These categories are: outcomes, participation, resources, impact, and purposes. Each of these categories is elaborated and defined. An argument is made that outcomes is the key category. Additionally, a caveat is presented in that the framework comprises an input/output model. Professionals in education typically dislike such models and prefer more expressive ones. Nevertheless, the input/output model is the only model that is well-defined. Moreover, it is understood and preferred by policy and decision makers and the public.

Suggestions are then made for data sets within each of the categories. Especially notable data sets discussed are the following ones: student achievement data (NAEP); course enrollment data; data regarding teacher quality as well as quantity; and data regarding curriculum content (e.g. commonly used textbooks).

Additional consideration is suggested for information in such special areas as: international comparisons; informal, out-of-school education; and technology in education. It is strongly recommended that NCES develop guidelines to facilitate compatibility among data collected at the state level and by other institutions and agencies. Additionally, special attention is urged for the encouragement and support of interpretations of data from NCES and other sources.

The paper concludes with a discussion of why data comparison is especially important. A focus on outcomes is urged, with other variables tightly linked to outcomes. Comparisons should be among states, within states, and among nations.

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Mission of the Education System

The elementary and secondary data program of the National Center for Education Statistics (NCES) should be designed to monitor the adequacy of the Nation's education enterprise in meeting individual and societal needs and expectations. To do this, a sense of mission for the enterprise is essential. One aspect of such a mission concerns the scope and level of knowledge and skill needed for the jobs of today and tomorrow. This refers to the adequacy of the education enterprise for maintaining the health and vitality of the U.S. economy. Two groups of particular interest in this regard are leaders and technical specialists. The significance of this aspect of the mission is reflected in such national reports as A Nation At Risk (National Commission on Excellence in Education, 1983) and Educating Americans for the 21st Century (National Science Board Commission on Precollege Education in Mathematics, Science and Technology, 1983).

But education can contribute to the national welfare through the preparation of leaders and technical specialists only to the degree that their work is understood by citizens and can be assimilated into our social structures. Accordingly, our education system must also produce informed citizens.

Additionally, education has long been the route by which upward mobility has been achieved by disadvantaged groups in our society. This has not changed. Thus, our education system must be instrumental in aiding those who have been excluded from full realization of their capabilities. This requirement for the education enterprise is stressed both for reasons of equity and to increase the size of pool of talent from which future leaders and technical specialists are drawn.

The inclusion of informed citizens and equity concerns in the foregoing is a reaffirmation of the Jeffersonian principle that an enlightened citizenry is the only safe repository of

control over the ultimate processes of society. This principle is clearly articulated in the reports of the National Commission on Excellence and the National Science Board Commission that were referred to earlier. Today, the issue of the adequacy of the education enterprise in addressing these purposes refers to the goal of a fully educated citizenry, not just a long schooled one (Resnick and Resnick, 1985).

In summary, a program for monitoring the education system of the U.S. must address the adequacy of the system for producing leaders, technical specialists, and informed citizens and for addressing equity concerns and optimal use of talent. Included within the definition of adequacy are considerations regarding numbers of students, cost-effectiveness, and the general health and capability of the system itself.

A Monitoring Framework

There are many ways to describe the education system and assess its adequacy. To help focus in on an approach, it is useful to consider categories of variables. The discussion here is an adaptation of the framework set forth by Dennis Gooler (1975). This organizing framework for the development of data or data series consists of five categories.

The first category we present is outcomes. This has two broad components: tests and credentials. Tests provide measures of what people know and what intellectual and performance skills they possess. Use and misuse of tests is a matter of considerable controversy. Accordingly, the use of tests and test data requires a balanced and thoughtful scrutiny. This issue is further discussed later in the paper.

The other component in this category, credentials, concerns such things as diplomas, certificates, and degrees awarded by the education enterprise for successful completion of programs or curricula. Patterns of credential earning also provide measures of outcomes of education.

I begin with the outcome category because I believe it is the most important and should constitute the focus of any program to monitor the education system. Moreover, the categories below should be developed in such a way as to link tightly to outcomes.

A second category is participation. This category addresses the question: Who does education serve? It concerns how many and what kinds of people take part in education and the form it takes. Included here are such elements as retention rates of education programs and patterns of curricular interests of students. My experience is that this category is second in importance only to outcomes and is essential to an understanding of outcome information.

A third category is the resources available to education. This may include personnel acting as teachers, institutions offering courses of instruction, or tax dollars. Resources may take the form of capital, personnel, or teaching materials. It may also include such things as types of educational programs offered, curricula, and the amount of time spent on them.

Resources available to education may well include educational research and development in that these contribute to improving education. Thus, measurement of support for educational R & D or of information portraying the scope and condition of the educational R & D enterprise should be considered in this category.

A fourth category of the proposed organizing framework concerns impact. This addresses the longer range effects of education extending beyond outcomes as discussed earlier. Impact addresses such questions as: To what uses do individuals put their education? What happens to individuals who participate in education? There are three types of relationships one might consider. One is the relationships among education, work, and income. Another type concerns such things as concepts of self-worth, participation in community affairs, and life styles. A third type might concern the impact of education on general social, cultural, and economic affairs.

The fifth and final category might be labeled purposes. This category would include data or data sets that provide descriptions of the needs of the education enterprise and expectations held for it. From these, of course, a general sense of mission for education can be derived and a set of purposes education is expected to serve. The preceding section offered one vision of the mission of the U.S. education enterprise. This category is explicitly included because there is a tendency to take purposes for granted. While a great deal of effort need not be devoted to this category, it is nevertheless useful to include in order to assure common understanding.

A caveat is in order about the framework presented here. Each age and culture defines education in terms of the meanings it gives to teaching and learning, and these meanings arise in part from the metaphors used to characterize teachers and learners. In the ancient world, one of the defining technologies was the potter's wheel with the student's mind; the analog of clay in the hands of the teacher. Later the defining technology was the mechanical clock (Kilpatrick, 1985). Other metaphors have likened education to agriculture or young students' minds to blank slates or empty vessels.

The framework presented above quite clearly embodies an economic metaphor or input/output model. A pejorative description is the "factory metaphor." One should realize that educational professionals and practitioners generally dislike this kind of metaphor and prefer more expressive ones that they believe more accurately reflect the subtlety of education.

However, there is the problem of going from metaphor to categories. I am not aware of any effort that completes an alternative metaphor as well as Gooler has rounded out the economic model. Moreover, the model presented here is recognizable by the general public and by decision and policy makers outside of education and probably preferred by them. As indicated earlier, outcomes is the key category. This view expresses strong agreement with Cooke, Ginsburg, & Smith (1985). There has always been a great deal of information (relatively speaking) about the inputs to education, but outcome information has been scarce and inaccurate. One of the most significant features of the current wave of public concern about education is a shift in focus from inputs to outcomes.

Suggestions for Data Sets

Rather than try to provide a complete list of data sets that might be included in each of the categories of our framework, I will focus on just a few that either are particularly important or represent something unusual in terms of what NCES has done in the past.

Outcome information is the key to any effective system for monitoring the condition of education in the U.S. In this regard, the issues raised by Cooke, Ginsburg, and Smith (1985) are germane. There is considerable interest in state-by-state comparisons, but the current information base for making such comparisons is quite inadequate. Progress is being made to allow state-by-state comparisons for National Assessment of Educational Progress (NAEP) results. This is very much to be encouraged as is argued further below.

Another issue is whether current tests are measuring the higher-order skills that are needed to function in a modern, technological society. There are also concerns that school curricula have narrowed to fit the narrow focus of tests on mastery of elementary-level basics even in the higher grades. Thus, there is a challenge to improve the adequacy of outcome measures and to do so in a manner that does not improperly distort the purposes of education.

With respect to participation, the amount of schooling people receive and drop-out rates are important items of information. But in my experience, the most sought after

indicator has been course enrollment data. Three excellent surveys of course enrollments were carried out by NCES in 1948, 1960, and 1972 but none since then. Some information on course enrollment behavior is part of High School and Beyond, but it is not comparable to the aforementioned survey data and is not reliable insofar as it is self-reported. A regular program (say, every five years) for collecting course enrollment data is urgently needed. NCES might consider doing so in a less exhaustive manner than was the case for the 1948, 1960, and 1972 surveys in order to control costs and reduce respondent burden.

With respect to resources, I have already observed that information portraying educational R & D would be useful. Additionally, some thought should be given to the question of quality of certain resources, especially teachers. I note with interest that the preprint of Indicators of Educational Status and Trends (1985) attempts to do this. Additionally, the importance of information regarding the quality of the teaching force is emphasized by the National Research Council report (1985).

A matter of special interest is the flexibility of supply of teachers. While there are many reports of unfilled teacher positions especially in certain fields such as mathematics and science, the supply of degree holders in mathematics and science in jobs other than teaching is high (NSF, 1980). A National Education Association study in 1983 also noted that a large number of persons not now in teaching jobs have completed the requirements for certification as public school teachers. Thus, information is required that goes beyond the numbers of persons in teacher preparation programs and considers the attractiveness of teaching as a career in terms of salary and working conditions.

Another kind of information that might be sought in the resources category is information regarding the substantive content of programs (NRC, 1985). An excellent source or surrogate would be textbook usage. That is, information about which textbooks are widely used would provide information about the content of school programs. Publishers accumulate such information, but they frequently regard it as proprietary.

Impact information can probably be developed with other agencies of government (e.g. Departments of Commerce and Labor) that address issues of economic vitality and personnel needs. Inclusion of information in this category is especially important now and for the foreseeable future because of fundamental changes obviously taking place in labor markets. The decline of traditional manufacturing jobs and the rise of the information society create a situation where the kinds of

academic abilities schools are best at developing appears to be increasingly in demand (Resnick and Resnick, 1985). Moreover, this category clearly expands the notion of what information is relevant to monitoring elementary and secondary education in light of a sensitive understanding of the mission of the education system.

With respect to purposes education is expected to address, I have referred to the National Commission on Excellence and the National Science Board Commission as sources. High school graduation requirements would be another indicator of what people expect of education. Additionally, expectations of the public and of prospective employers might be surveyed directly.

In summary, NCES is encouraged to emphasize the following data sets:

- Outcome information, especially as provided by the National Assessment of Educational Progress.
- Participation as provided by course enrollment data.
- Information on teachers in terms of quantity and quality.
- Information on curriculum content.

Additional Considerations

Some considerations in addition to the foregoing on information needed to address issues of monitoring elementary and secondary education are presented. The additional considerations are five in number.

International Comparisons. Current concerns about American education arise substantially from the belief that U.S. education is weakening, but other nations are improving their education. These nations include our most powerful economic (Japan) and military (U.S.S.R.) competitors. They have made strong national commitments to and have displayed considerable success in educating large proportions of their secondary school populations to higher levels of skill and understanding than is the case in the U.S. (NSF, 1980). This belief is expressed by both the National Commission on Excellence and the National Science Board Commission.

Nevertheless, there is some controversy about the belief as stated above. For example, Americans have greater access to higher education, and the American system is much more flexible in allowing individuals to move in and out of the education system over their entire lives. Thus, international comparisons between elementary and secondary education systems and practices may be inadequate. One must look at life-long patterns of education and the relation of education to individual and societal well-being. In any case, a data program designed to address emerging or continuing issues should include consideration of the international scene in some realistic way.

Informal, Out-of-School Education. Learning activities in schools are designed to be structured and intentional. Yet, there is increasing recognition that much that effects the quality of formal education occurs outside the classroom and beyond the control of the school. A great deal of learning takes place unintentionally and unconsciously through casual reading and other experiences, especially through television and museums (National Science Board Commission, 1983).

Accordingly, information regarding education in out-of-school settings should be studied. We have already mentioned television and museums as focal points. But libraries and community groups such as Boy Scouts and Girl Scouts should also be taken into account.

Technology. Technology, if we include such things as books and chalkboards, has always been intrinsic to education. But the computer and other complex technologies that have recently emerged are having especially significant impact on both the content and delivery of education (Buccino, 1985). It is desirable, and may even be necessary, to identify and collect explicit information regarding technology. This could include information on misuse or ineffective use of technology to the extent that these occur.

Data Compatibility. A great deal of data is collected at the state level and by other institutions and agencies. Unfortunately, little consideration is given to compatibility issues. This is so because the state-level data collectors have little guidance and are not in a good position to know how to design their own data collection for such compatibility. NCES can make a valuable contribution by developing explicit guidelines for state-level data collection that provide for making these data compatible among themselves and with the national data sets. Of course, following the guidelines would be voluntary.

Interpretation. Data cry for interpretation. When educational data are published in the press or reported on television, we are deluged with requests from the public to explain what they mean. Moreover, the publication of data, as such, can even be misleading in the absence of appropriate interpretation. Accordingly, I strongly urge that NCES engage other programs in the Department of Education and other federal agencies to encourage and support interpretations of data from NCES and other sources.

An interesting example regarding the need for careful interpretation concerns the impact of high technology on the knowledge and skill levels needed by workers. Some argue that

as technological complexity of the U.S. economy increases, jobs at all levels increasingly require higher levels of knowledge and skill. But Levin and Romberger (1983) argue that proliferation of high technology industries and their products is far more likely to reduce the skill requirements of jobs in the U.S. than upgrade them. While questioning the impact of technology on the knowledge and skills needed for the economy, Levin and Romberger do argue for higher levels of education on the basis of the ideal of informed citizens and personal well-being.

To a certain extent, the Condition of Education and other NCES data publications have tried to do this. What I suggest here is something like a series of about five substantial interpretive papers annually to be published along with data sets. Such papers might well focus on emerging issues with a separate discourse for tracking continuing issues. The image here is a modified Condition of Education. It would have two parts. One part would present data in graph and table form organized in accord with the framework and categories suggested earlier. The other part would comprise a collection of about five substantial analytic and interpretive papers focusing on emerging issues and a review of status regarding continuing issues.

The Problem of Standards and the Importance of Comparisons

The paper is closed with a discussion of why data comparison is especially important. While it is relatively easy to develop criteria to monitor the adequacy or performance of the education system, it is much more difficult to develop standards -- which determine the degree to which criteria are met. A criterion is a characterizing mark or quality. In this context criteria might well be the categories forming a framework for assessing the condition and progress of the American education system that were discussed earlier. These are: outcomes, participation, resources, impact, and purposes.

A standard is an exemplar of a criterion, a definite level or degree of the quality, defined by the criterion, that is adequate for a specific purpose. For example, large may be a criterion, while for different purposes the Empire State Building, or a whale, or a meter may constitute the definite level or degree of largeness that is adequate.

Given a criterion, there are two essential methods for establishing a standard. One is to identify an objective exemplar. We do this, for example in the case of length, when we select a certain specific platinum-iridium bar to represent the length of one meter and place it in the Standards vault in Paris. Thereafter, an object is said to have length one meter if it is equal in length to the exemplar, the platinum-iridium bar in the vault.

But we do not always have an objective exemplar identified in this way to place in a vault. This gives rise to the second method for establishing a standard. This is the method of comparison. It is not always easy, for example, to determine whether a given object is large. However, it is usually quite easy to decide, given two objects, whether one is larger than the other.

Thus, generally speaking, it is usually quite difficult to determine the degree to which a given object possesses a specific quality. On the other hand, given two or more objects, it is relatively easy to compare them to each other with respect to the quality in question and assert the relative degree of the quality reflected in the objects.

This illustrates the fundamental problem confronted by NCES. Given such criteria as we have discussed, there are very few objective exemplars for measuring the degree to which a school system possesses these qualities. The only recourse is comparison, and comparison is controversial from a political point of view. If the condition of one school system is "better" than another, then -- logically -- the other's condition has to be "worse" than that of the first. It may be all right to be better, but it is usually unacceptable to be worse.

In this paper, we set forth a set of criteria (qualities) that NCES should use in monitoring the U.S. education system. Typically, exemplars for these criteria are not available. Accordingly, NCES must consciously develop a comparative approach in order to set forth standards to accompany the criteria. As we have suggested, the comparisons may be among states. They may also be among nations and within states.

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